



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/510,389	12/14/2004	Nobuo Ishii	101248.55500US	6492

23911 7590 08/21/2007
CROWELL & MORING LLP
INTELLECTUAL PROPERTY GROUP
P.O. BOX 14300
WASHINGTON, DC 20044-4300 ,

EXAMINER

DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
----------	--------------

1763

MAIL DATE	DELIVERY MODE
-----------	---------------

08/21/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/510,389

Applicant(s)

ISHII, NOBUO

Examiner

Rakesh K. Dhingra

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 1763

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claim 1 by adding new limitation "said top plate portion and said antenna portion are arranged with a space there between".

New reference (US PG PUB No. 2002/0129904 –Itabashi et al) when combined with Ishii et al (US PG PUB No. 2002/0038692) reads on amended claim 1 limitations. Accordingly claims 1-4 have been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishii et al (US PG PUB No. 2002/0038692) in view of Itabashi et al (US PG PUB No. 2002/0129904).

Regarding Claim 1: Ishii et al teach a plasma processing apparatus (Figures 1, 9, 14, 20) for effecting predetermined processing on a substrate by exposing the substrate to a plasma production region, comprising:

a chamber 11 in which the substrate 21 is introduced;

Art Unit: 1763

a top plate portion (dielectric plate 13) arranged above said substrate 21 introduced in said chamber, and forming a part of a wall of said chamber 11; and

an antenna portion 30 supplying a high-frequency electromagnetic field into said chamber to form the plasma production region in a region between said top plate portion 13 and said substrate 21 located in said chamber 11, wherein said antenna portion 30 includes a radial waveguide 36 having a predetermined inner diameter, said chamber 11 has a predetermined inner diameter in a portion containing said top plate portion 12 and said antenna portion 30 (paragraphs 0048-0058). Ishii et al also teach that by using formula 27 (paragraph 0144) it is possible to compute composite dielectric constant of the space portion containing the window and the slot antenna, if other variables like dielectric constant of top plate (window), dielectric constant of the space between window and antenna (air in this case), thickness of dielectric window and the gap between the window and the slot antenna are known (Figure 14 and paragraphs 0144-0146). Based on this composite dielectric constant, value of wavelength $\lambda_{sub.g}$ (given in the claim) can be calculated (by using formula $\lambda_{sub.g} / \text{dielectric constant}$).

Ishii et al teach inner diameter of the radial waveguide (Figure 9A), but do not teach relative dimensions of the inner diameter of radial waveguide and the portion containing top plate portion and the antenna portion.

Itabashi et al teach a plasma apparatus (Figure 2) comprising:

A processing chamber 305 with a quartz window 301, an antenna 308 and a gap 302 between the antenna and the dielectric window. Itabashi et al further teach a standing wave controlling part (similar to part 106 in Figure 1, and having a characteristic length d) to provide control of plasma density. Itabashi et al also teach an extended diameter quartz plate 302 having a diameter that is greater than chamber internal diameter by about 108 mm (where 108 mm is generally equivalent to distance "B-A" of the claim, considering external diameter of quartz plate 301 as dimension "B", and diameter of antenna spacer 309 as dimension "A"). Itabashi et al additionally teach that composite dielectric constant of dielectric plate

Art Unit: 1763

301(made of quartz) and air gap 302 can be taken around 3.3 to 3.6 [for example, Figures 1,17 and paragraphs 0152- 0172].

Thus calculated value of "A-B" would range from 101.6 to 110.9 (considering a microwave wavelength of 12.2 cm and using a natural number value of 6) which includes the value of 108 mm (B-A)/2, thus meeting the limitation as per claimed formula.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to use the antenna and chamber geometric dimension configuration as taught by Itabashi et al in the apparatus of Ishii et al to control formation of standing waves in the chamber portion containing the air gap and the dielectric plate so as to obtain a stable plasma with uniform plasma density.

Regarding Claim 2: Itabashi et al teach that chamber 305 internal diameter C is less than the diameter of antenna spacer 309 (that is equivalent to internal peripheral diameter antenna, dimension "A"), that is $C \leq A$, as per claim limitation (Figures 2, 17).

Regarding Claims 3, 4: Itabashi et al teach that top plate 301 is made from quartz (dielectric material).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 1763

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Rakesh K. Dhingra



Karla Moore
Primary Examiner
Art Unit 1763